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FISHERIES DIVISION

JOB PROGRESS REPORT

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ABSTRACT

Populations of brown, rainbow and Yellowstone cutthroat trout in the Upper Yellowstone River are discussed. Brown trout are primarily mainstem spawners and migrate extensively to use side channel areas for spawning. Rainbow trout spawn primarily in Nelson and Armstrong Spring Creeks. Populations of rainbow trout are highest near these creeks and the fish migration patterns are related to the Spring Creeks. Large Yellowstone cutthroat trout are increasing in numbers as a result of a strong year class. Cutthroat spawn heavily in tributary streams and exhibit movement patterns which relate to the spawning tributaries. Dewatering of these tributaries may be limiting Yellowstone cutthroat populations in the Yellowstone River.

Two sections of the Shields River were sampled. Brown trout in the Zimmerman section may be limited by summer flows, and recruitment of young brown trout appears to be higher than past studies indicated.

Small streams were sampled to assess the status of the resident populations. The population of trout in Mol Heron Creek has increased since 1973, and the population in McDonald Creek has decreased since 1974. The decrease in McDonald Creek may be related to stock grazing and sedimentation. Brook trout may be competing with Yellowstone cutthroat trout in the North Fork of Brackett Creek. Repopulation of Fleshman Creek by young trout is taking place and sampling of several other streams is discussed.

Dailey Lake was rehabilitated and rainbow trout do not appear to be surviving the first year after stocking.

Stream protection efforts are discussed. The Shields River appears to be recovering from abuses prior to enactment of the Natural Streambed and Land Preservation Act of 1975.

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OBJECTIVES AND DEGREE OF ATTAINMENT

1. To determine fish populations on at least two established study sections on the Yellowstone River and one established study section on the Shields River. Data is presented.

2. To monitor water temperatures at three established sites on the Yellowstone River. Data is presented for one site.

3. To assess walleye planting success in Dailey Lake. Data is presented.

4. To mitigate or enhance habitat alterations due to agricultural, residential, mining and industrial development. Data is presented.

BACKGROUND

The Yellowstone River basin received instream flow protection through the Order of the Board of Natural Resources on December 15, 1978. With this reservation of water, the Department of Fish, Wildlife and Parks was instructed to update and enhance its justification for receiving the allocation. Continued monitoring of the Yellowstone River fish populations is required to learn more about the relationships between stream flows and fisheries.

Recent information suggests that fishing pressure may be altering the population structure of trout in the upper Yellowstone. During 1984 fishing regulations were changed on the upper 50 miles of the Yellowstone River to protect the Yellowstone cutthroat trout (Salmo clarki bouvieri) population. In a shorter reach of the river, rainbow trout (Salmo gairdneri) and brown trout (Salmo trutta) also received added protection. The results of these regulations should be monitored annually.

Past information indicates that trout populations in the Shields River are limited to some degree by instream flows during the summer months. This information should be refined.

When the Yellowstone reservation was enacted, other streams in the basin were also given instream flow protection. Baseline information on tributary streams which support spawning migrations of Yellowstone River fish should be collected to document their importance to the Yellowstone River fishery. Resident populations of fish in these streams are also protected and information about these fish is being collected.

The Dailey Lake fishery is composed of stunted yellow perch (Perca flavescens), rainbow trout and walleye (Stizostedion vitreum). Attempts to manage this fishery have included periodic rehabilitation and stocking of rainbow trout and walleye.

The Department of Fish, Wildlife and Parks is responsible for protecting and enhancing the fishery resource in Montana. The Stream Protection Act of 1963 and the Natural Streambed and Land Preservation Act of 1975 were passed

by the state legislature in order to give the Department the ability to protect the physical integrity of streams. These laws have been a valuable aid in protecting the fishery resources of Montana.

PROCEDURES

Fish populations were sampled in the Yellowstone River using an 18-foot aluminum boat powered by an 80-hp outboard jet motor. The boat was equipped with a double boom electrode system which was designed according to Novotny and Priegel (1971) as modified by Peterman (1978).

Generally, three mark and three recapture runs were made on each section to obtain a population estimate. Also, electrofishing was conducted in various sections of the upper Yellowstone during 1984 for the purpose of characterizing spawning concentrations and tagging fish to monitor seasonal movements. All movement data was collected from tag returned fish.

Tributary streams were sampled by various methods. Steel frame trap nets were used in some tributaries. These traps were checked daily for fish retrieval and cleaning purposes. Other streams were electrofished with either a bank shocking unit or a backpack electrofishing unit. The backpack unit was used on small streams and the "bank" shocking unit was used on larger streams.

Resident fish populations in streams were sampled by "bank" shocking or a backpack shocking unit. Generally, one mark and one recapture run were made on each 1000 foot section to obtain a population estimate. In the Shields River, fish populations were sampled with a boat mounted mobile electrode system. All population estimates were calculated according to Vincent (1971).

Brown trout in the Yellowstone River and the Zimmerman section of the Shields River were aged with the use of "known age" fish.* Fish were also aged using length frequencies and scales.

Water temperatures in the Shields River were measured with maximum/minimum thermometers while flows were measured with a hand held current meter and stage measurements.

During August of 1984 Dailey Lake was "rehabilitated" to remove portions of the yellow perch population. 200 gallons of a rotenone mixture were mixed into the shallow portions of the lake. Specimens of yellow perch, walleye and rainbow trout from the resultant kill were measured and weighed for the survey purposes.

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*Known age fish are identified by a missing fin which was removed when the fish were of known age. Past studies have resulted in contradictory conclusions concerning mortality caused by fin removal (Brynildson and Brynildson, 1967; Nicola and Cordone, 1973; Mears and Hatch, 1976). In our studies we do not clip fingerling or smaller fish.

FINDINGS

Yellowstone River

Four study sections were sampled in the Yellowstone River for population estimates during 1984 (Figure 1). Also, sampling was done in several areas to collect information on trout spawning concentrations and movement. The following discussion pertains to brown, rainbow, Yellowstone cutthroat trout and mountain whitefish (Prosopium williamsoni) populations in the upper Yellowstone River.

Brown trout

Populations. Population estimates of 16 inch and longer brown trout per mile in the four study sections are illustrated in Figure 2. The Springdale and Ninth Street Bridge study sections appear to support similar populations of large brown trout, which have been decreasing since 1982. The Mill Creek Bridge section supports the highest population of 16 inch and longer brown trout during most years and the Corwin Springs section supports the least, possibly because of slower growth (Clancy, 1983).

The number of brown trout longer than 16 inches is fairly evenly distributed throughout the upper Yellowstone. This may be due to the fact that brown trout are mainstem spawners and they use many different areas in the river for spawning purposes.

The Corwin Springs section supports the largest number of 3 year old and older brown trout (Table 1), but they tend to be smaller than in the other sections because of slower growth.

Table 1. The average number of 2 year old and 3 year old and older brown trout per mile in the four study sections during 1982, 1983 and 1984.

	2 Year Olds	3 Year Olds and Older
Springdale	80	187
Ninth Street Bridge	196	280
Mill Creek Bridge	93	245
Corwin Springs	96	371

Movement. Brown trout in the Yellowstone River appear to rely on side channels within the mainstem for spawning purposes. While some tributaries are used, most side channel areas receive use by spawning brown trout.

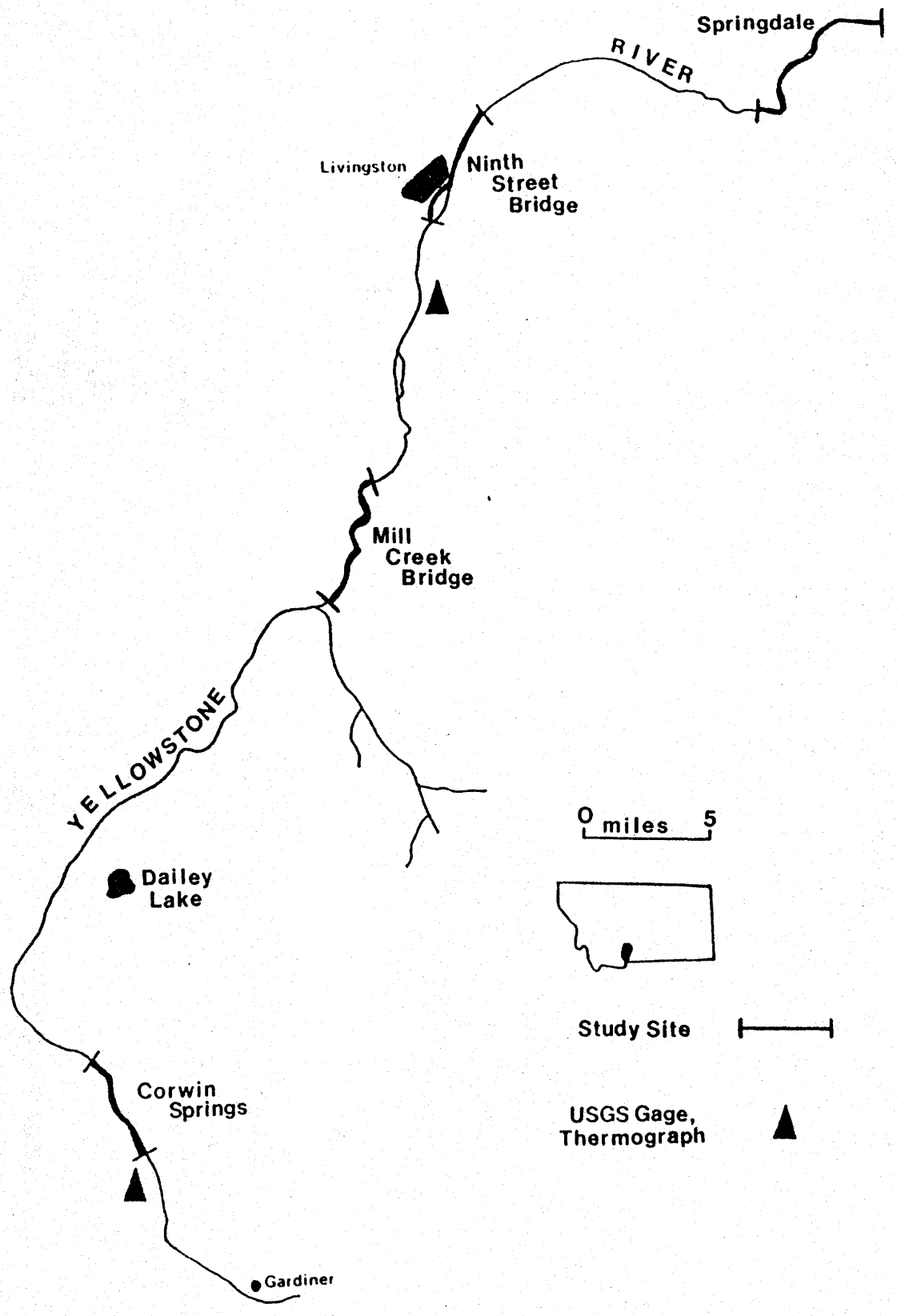


Figure 1. Map of the Upper Yellowstone River showing the location of the four study sections.

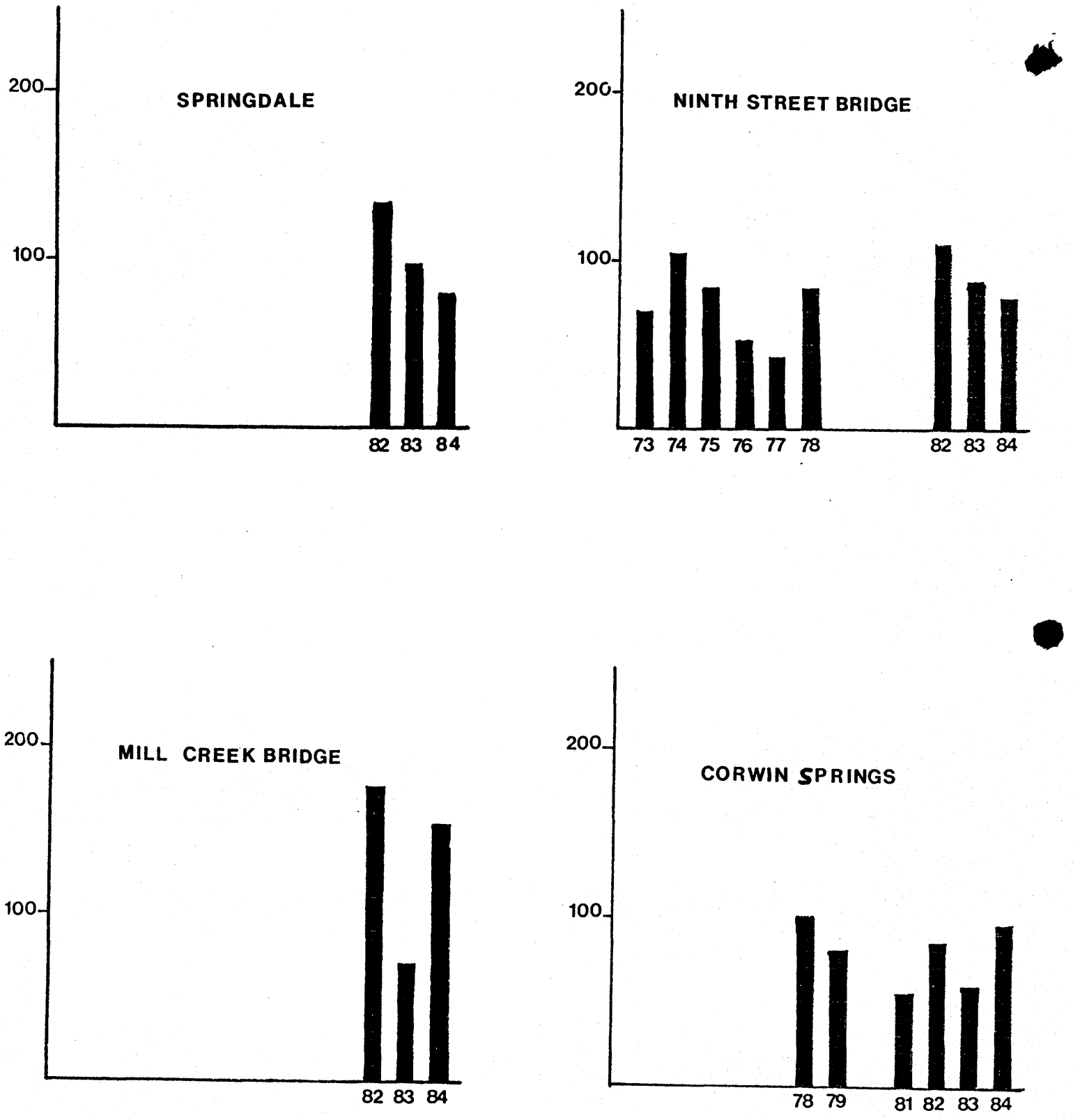


Figure 2. Spring population estimates of 16 inch and longer brown trout per mile during the year indicated in the four study sections.

Figure 3 depicts three side channel areas in the river which were sampled during 1984 to assess brown trout spawning and movement. Brown trout were tagged during April and May of 1984 and recaptured during October, November and December to assess movement patterns.*

Livingston Side Channels. The braiding of the river in the Livingston area is conducive to brown trout spawning. Tag returns from this area indicate that brown trout move upstream from as far away as Springdale (23 miles) to spawn in this area. Few returns were collected, however, and future efforts should be intensified to characterize the run.

Vital statistics of the brown trout in the Livingston side channels are listed in Table 2.

Table 2. Vital statistics of the spawning concentration of brown trout larger than 14 inches in the Livingston side channels during fall, 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Spawning Condition
11/7	14	(17.6)	18	(16.9)	Females in all stages
11/13	10	(16.6)	16	(17.4)	Females mostly spawned out
Total	24	(17.2)	34	(17.1)	

Pine Creek Island. This area supports the heaviest spawning concentration identified in the Yellowstone River to date. Tag returns indicate that brown trout move into this area from as far downstream as Springdale (34 miles) and as far upstream as the Mill Creek Bridge area (10 miles).

Vital statistics of the brown trout in the Pine Creek Island area during 1983 and 1984 are listed in Tables 3 and 4.

* Shuck (1943) found that large brown trout migrated upstream in October and November and returned to their home territory by the following spring. Mense (1975) tested the hypothesis that brown trout display more movement when populations are dense, however, he could find no correlation between population size and movement patterns.

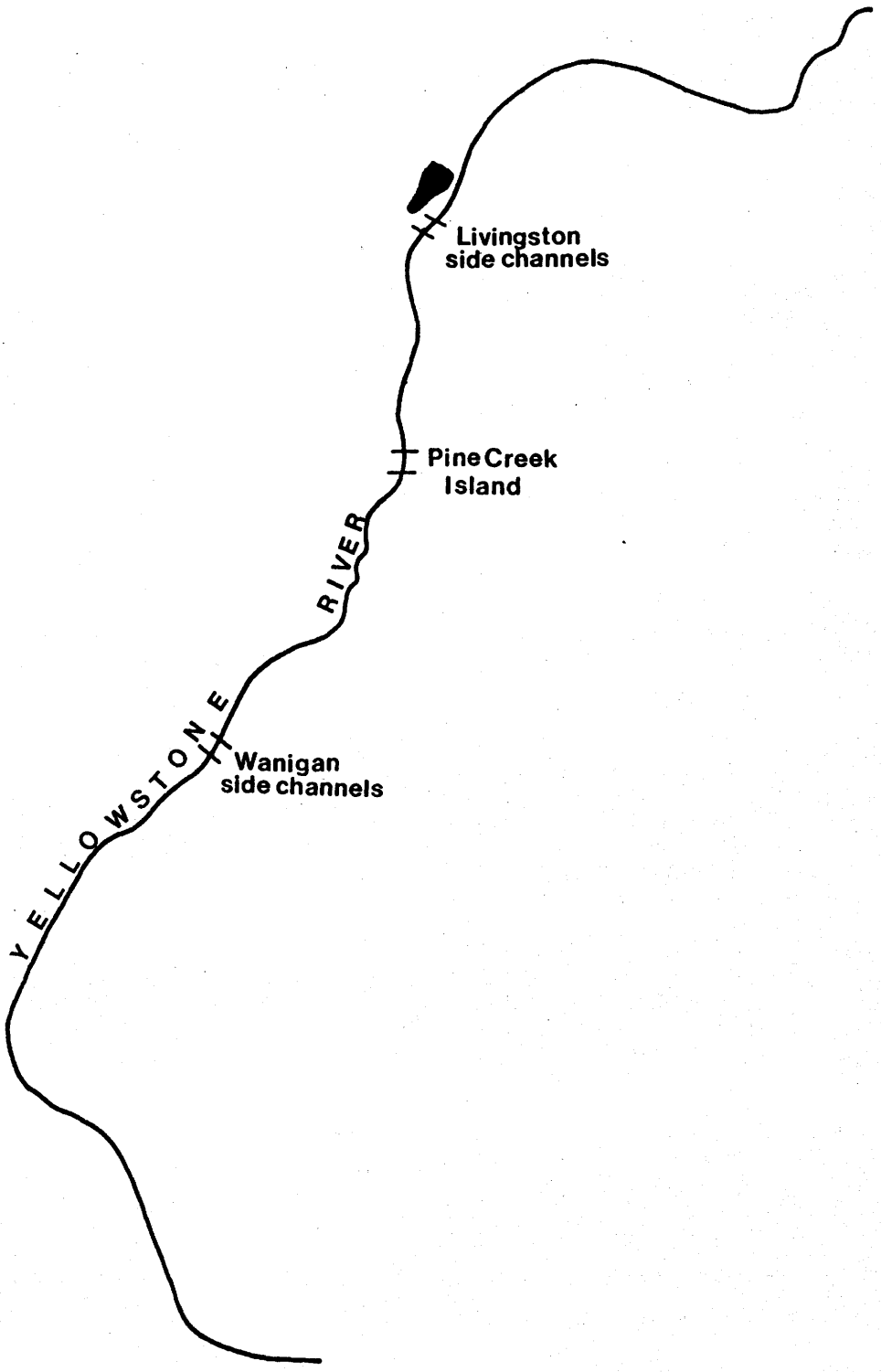


Figure 3. Yellowstone River mainstem areas sampled for brown trout and rainbow trout spawning concentrations.

Table 3. Vital statistics of the brown trout longer than 14 inches captured in the Pine Creek Island area during fall, 1983.

Date	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Spawning Condition
10/30	55	(17.0)	59	(16.9)	Females not emitting eggs
10/27	58	(17.6)	70	(17.0)	Few females emitting eggs
11/04	36	(17.1)	60	(16.8)	Most females emitting eggs
11/10	46	(16.9)	40	(17.1)	Nearly all females emitting eggs
11/29	11	(17.2)	17	(16.6)	Nearly all females spawned out
Total	206	(17.2)	246	(16.9)	

Table 4. Vital statistics of the brown trout longer than 14 inches captured in the Pine Creek Island area during fall, 1984.

Date	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Spawning Condition
10/19	5	(17.4)	5	(16.1)	Few females emitting eggs
10/31	46	(17.3)	32	(17.5)	Half of females emitting eggs
11/04	44	(17.0)	44	(17.4)	Most females emitting eggs
Total	95	(17.2)	81	(17.4)	

The average size of fish sampled during 1983 and 1984 was similar, although females were somewhat larger during 1984 than 1983. Using spawning condition of females as an indicator of peak spawning, it appears that the second to third week of November is the peak of spawning. The females in this area appear to spawn slightly later than at the Livingston side channels.

Wan-i-gan Side Channels. Side channels in this area support a substantial amount of brown trout spawning. Tag returns indicate that the fish spawning in this area come from as far downstream as the Mill Creek Bridge area (9 miles), however, few tags were collected. Vital statistics of this spawning concentration are listed in Table 5.

Table 5. Vital statistics of the brown trout longer than 14 inches in the Wan-i-gan side channels during 1984.

Date	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Spawning Condition
11/1	37	(16.9)	27	(16.3)	Females not emitting eggs
11/9	25	(16.7)	20	(16.6)	Few females emitting eggs
11/20	11	(16.4)	11	(15.6)	Most females emitting eggs
Total	73	(16.8)	58	(16.3)	

The fish in this area are smaller, on the average, than the downstream sites discussed previously and spawning during 1984 appeared to peak later than the downstream sites.

Emigrant Spring Creek. During the fall of 1984, the lower 400 feet of Emigrant Spring Creek was electrofished at weekly intervals (Figure 7). Table 6 illustrates the vital statistics of this sampling effort.

Table 6. Vital statistics of the brown trout longer than 14 inches in the lower 400 feet of Emigrant Spring Creek during 1984.

Date	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Temp. Max/Min	Spawning Condition
10/29	1	(17.0)	2	(19.7)	48-42	Females emitting eggs
11/8	4	(16.8)	6	(16.6)	50-42	Females emitting eggs
11/14	6	(16.2)	6	(16.9)	48-42	Females emitting eggs
11/20	1	(16.6)	1	(17.2)	47-42	Females spawned out
Total	12	(16.5)	15	(17.2)		

Spawning appeared to peak in mid-November during 1984.

Nelson Spring Creek. During the fall of 1984, the lower 500 feet of Nelson Spring Creek was electrofished to sample the brown trout which moved into the creek to spawn (Figure 7). This creek supports a resident population of brown trout, so the statistics include resident and migratory fish. Table 7 characterizes this run.

Table 7. Vital statistics of the brown trout longer than 14 inches in the lower 500 feet of Nelson Spring Creek during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Temp. Max/Min	Spawning Condition
10/16	Sex undetermined					Females not emitting eggs
10/29	Sex undetermined				52-46	Females not emitting eggs
11/7	17	(16.2)	12	(16.8)	52-44	Females varied
11/13	18	(15.9)	11	(17.0)		Females varied

From the data it is not clear when the peak of the run occurred. Few fish were in spawning condition in October and the mixture of resident and migratory fish also complicates the information.

Stutches Spring Creek. During October and November of 1984 a trap was installed at the mouth of the creek. A few male brown trout were captured, but it is unclear whether this stream is used by migratory brown trout.

Armstrong Spring Creek. Water leakage from Armstrong Spring Creek seeps into a side channel of the Yellowstone River (Figure 7). This side channel was sampled on three occasions during the fall of 1984. The data is listed in Table 8.

Table 8. Vital statistics of brown trout longer than 14 inches in the Armstrong side channel during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Spawning Condition
11/2	4	(16.6)	4	(17.3)	No females emitting eggs
11/8	4	(17.1)	1	(15.4)	
11/14	7	(16.9)	4	(16.8)	Females emitting eggs
Total	15	(16.9)	9	(16.9)	

The concentration of brown trout in the Armstrong side channels is much lighter than rainbow trout in the spring.

McDonald Creek. A trap was installed at the mouth of this creek during the fall of 1983. No fish were captured in the trap, however, high flows and debris caused the trap to malfunction most of the time.

Rainbow Trout

Populations. Population estimates of rainbow trout longer than 16 inches per mile in the four study sections is illustrated in Figure 4. The Ninth Street Bridge section supports the highest population of rainbow trout. This may be related to available spawning areas, most of which are a short distance upstream of the section. The distribution of rainbow trout is very uneven in the upper Yellowstone River. Unlike brown trout, rainbow trout tend to spawn in limited areas that are in close proximity to each other.

The populations appear to have increased slightly between 1983 and 1984. Clancy (1984) discusses possible reasons for the decline between 1982 and 1983.

The spring population estimates for rainbow trout contain some error which is attributed to spawning movement. The fish are in the process of moving away from these spawning areas in April and May when estimates are in progress. It is not known how much bias is introduced by this movement.

Movement. Rainbow trout display some consistent movement patterns in the upper Yellowstone.

Armstrong Spring Creek and Nelson Spring Creek are both used by rainbow trout for spawning purposes. Tag returns during the spring of 1984 indicate that rainbow trout using Armstrong Spring Creek came from as far downstream as Livingston and as far upstream as Pine Creek. Of the fish that were tagged while spawning in Armstrong Spring Creek, later returns indicated that fish were found downstream of the creek as far as Springdale (29 miles). None of the fish captured while spawning in the creek were recaptured upstream.

Two tag returns were collected in Nelson Spring Creek, both were from the Pine Creek Island area.

Rainbow trout do not appear to use the mainstem of the Yellowstone River for spawning to the extent that brown trout do. The Pine Creek Island area was sampled during March and April of 1984, where a small number of fish and spawning activity were observed.

Movement of rainbow trout between the Pine Creek Island area and other points on the river is evident. Tag returns indicate some movement into the area from Springdale, Livingston and the Mill Creek Bridge area during the spring. There is also a late spring movement out of the Pine Creek Island area and upstream at least as far as Mill Creek Bridge.

Considerably more movement information about rainbow trout must be collected to understand the extent and purpose of the movement and its relationship to populations.

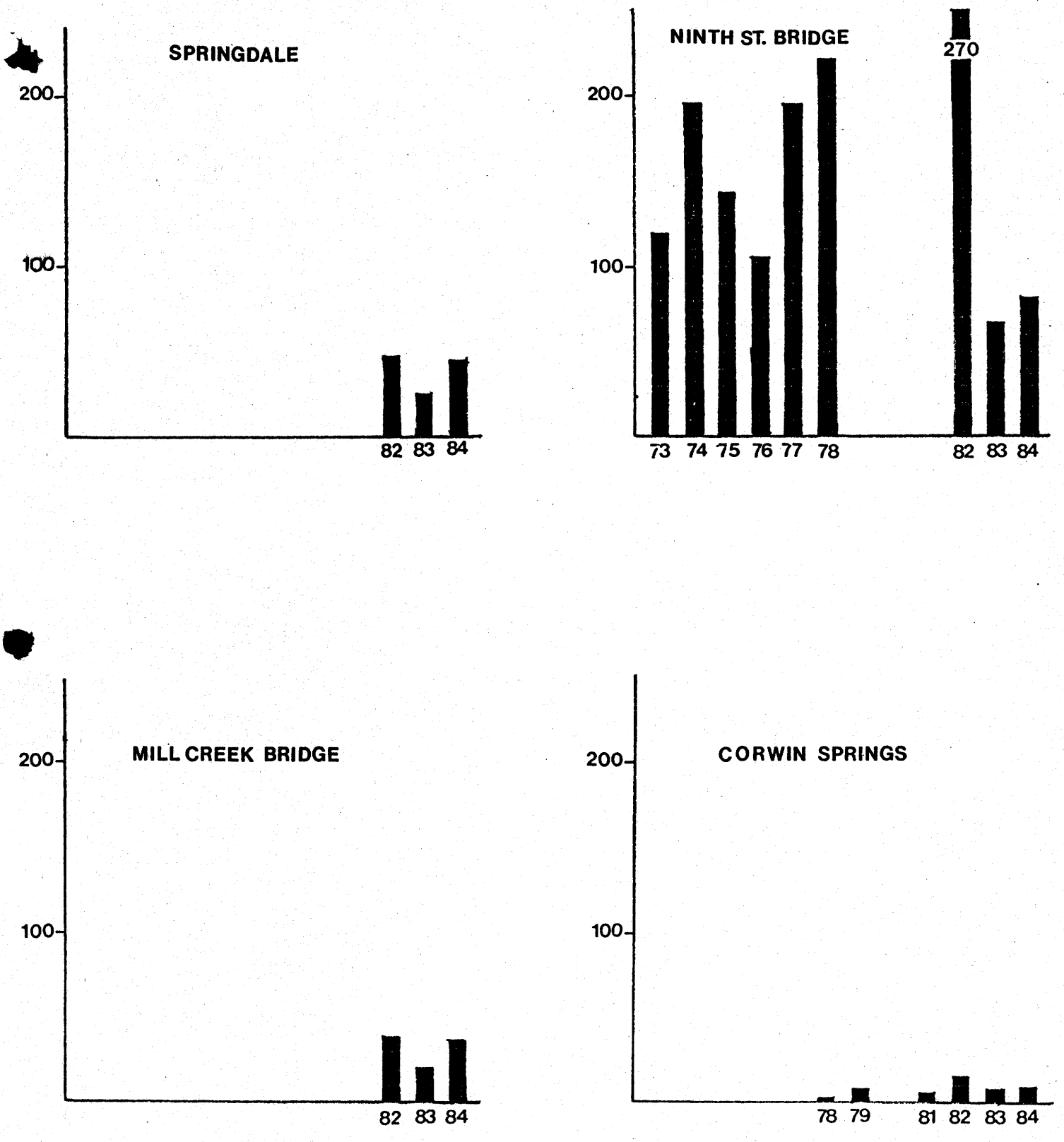


Figure 4. Spring population estimates of 16 inch and longer rainbow trout per mile during the years indicated in the four study sections.

Vital statistics of the rainbow trout longer than 14 inches in the Pine Creek side channels, Armstrong Spring Creek and Nelson Spring Creek during spring 1984 are presented in Tables 9, 10 and 11.

Table 9. Vital statistics of rainbow trout longer than 14 inches in the Pine Creek side channels during spring, 1984.

Date	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Spawning Condition
3/1	14	(16.9)	16	(16.4)	Females not emitting eggs
3/5	3	(16.5)	2	(20.1)	Females not emitting eggs
3/23	11	(17.2)	7	(16.6)	Females not emitting eggs
3/28	12	(16.9)	8	(16.4)	Most females emitting eggs
4/10	3	(16.5)	5	(15.9)	Females spawned out
Total	43	(16.9)	38	(16.6)	

The number of rainbow trout spawning in the Pine Creek side channels during the spring appears to be much lower than brown trout in the fall. The peak of spawning activity in the Pine Creek side channels appears to have been in late March when the females were emitting eggs.

The characteristics of the spawning concentration near Armstrong Spring Creek is illustrated in Table 10.

Table 10. Vital statistics of rainbow trout captured in a trap in a side channel of the Yellowstone River fed by Armstrong Spring Creek during spring, 1984.

Dates	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Temp. Max/Min	Spawning Condition
2/1-2/15	11	(15.4)	6	(17.1)	51-38	Females emitting
2/16-2/29	30	(16.3)	15	(17.0)	53-44	eggs during entire
3/1-3/15	106	(15.6)	90	(16.3)	54-44	period
3/16-3/30	30	(15.7)	73	(16.0)	56-45	
Total	177	(15.7)	184	(16.3)		

Sampling began in early February at which time a few fish were already in the area. The average lengths of these fish are not comparable to those in Table 9 because all of the fish in the Armstrong side channel are included and only fish longer than 14 inches are included in Table 9.

The largest numbers of fish appeared in the area throughout the month of March. During early March mostly males were moving into the area and during late March mostly females were moving in. This may indicate that late March is the peak of spawning, similar to the Pine Creek Island area.

A limited amount of trapping was conducted in Nelson Spring Creek during March of 1984. The characteristics of the fish captured during sampling is presented in Table 11.

Table 11. Vital statistics of rainbow trout trapped in Nelson Spring Creek during March 20-30, 1984.

Dates	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Temp. Max/Min	Spawning Condition
3/20-3/30	19	(16.0)	10	(15.8)	56-44	Half of females emitting eggs

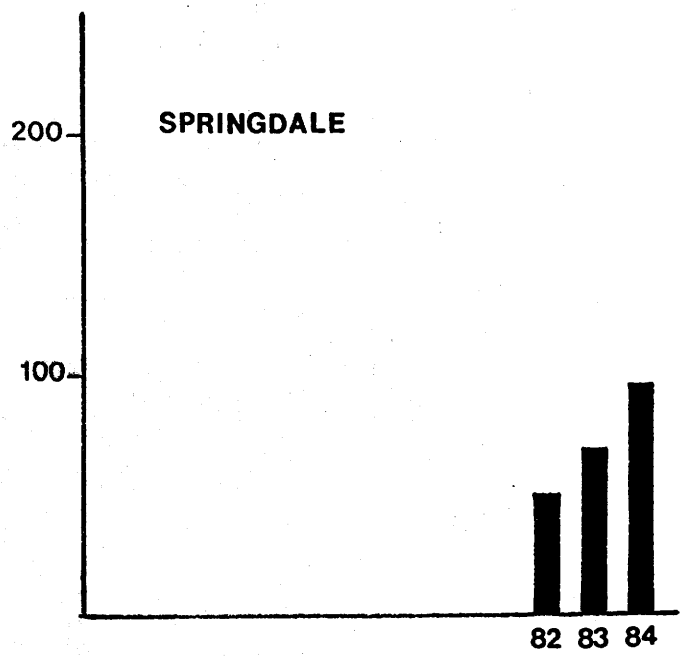
The mean size of fish collected is in the same range as those trapped at Armstrong Spring Creek. The catch of fish during late March was mostly males in Nelson Spring Creek, while the catch in Armstrong Spring Creek during the same time period was mostly females. The difference between the two is not understood at this time.

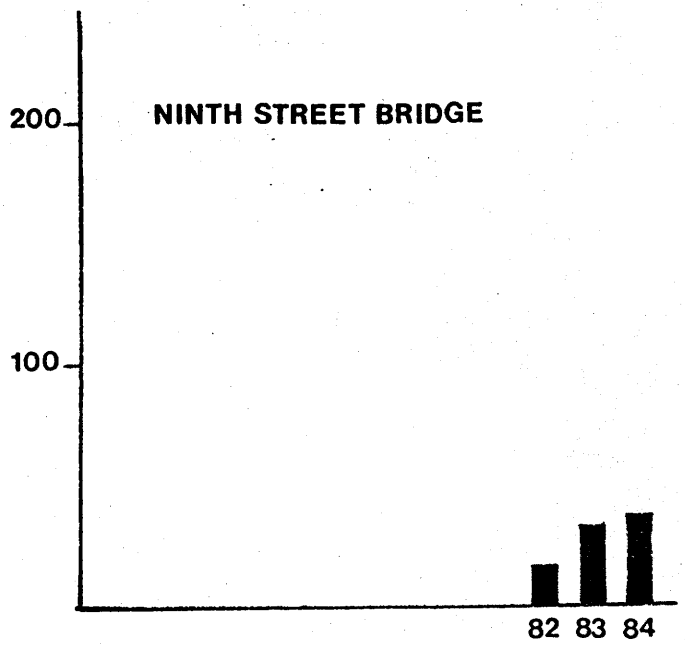
McDonald Creek, Emigrant Spring Creek, Peterson Creek. Traps were installed in these creeks during February and March of 1984. No migratory rainbow trout were captured in these creeks. The trap in McDonald Creek is difficult to maintain and may have possibly missed fish during this time.

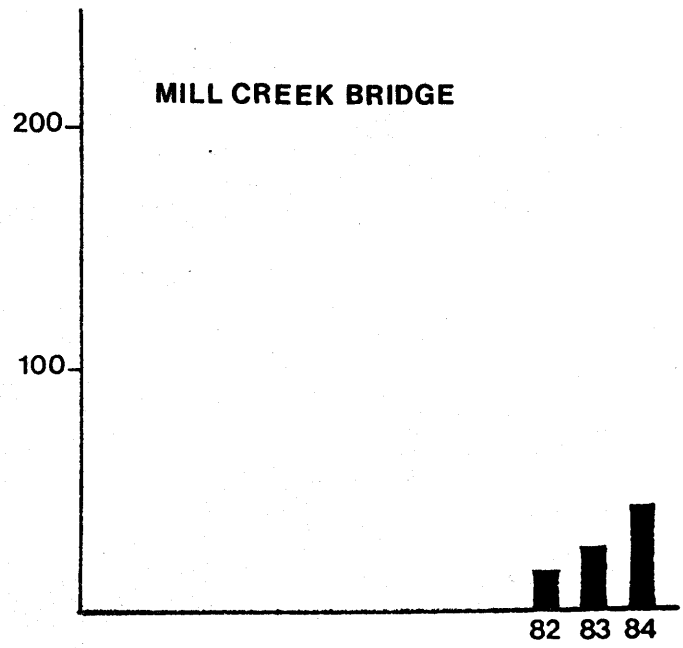
Yellowstone Cutthroat Trout

Populations. Population estimates of 12 inch and longer Yellowstone cutthroat trout are depicted in Figure 5.

Since 1982, the population of larger cutthroat have been increasing. This appears to be related to a strong year class which hatched during 1980. During 1982 this year class was 7 to 9 inches long. By 1983 it was 11 to 13 inches long, and by 1984 the 1980 year class was mostly longer than 12 inches, resulting in increased numbers of 12 inch and larger fish. Javorsky (1984) found that this year class comprised 83% of the spawners in Cedar Creek. This







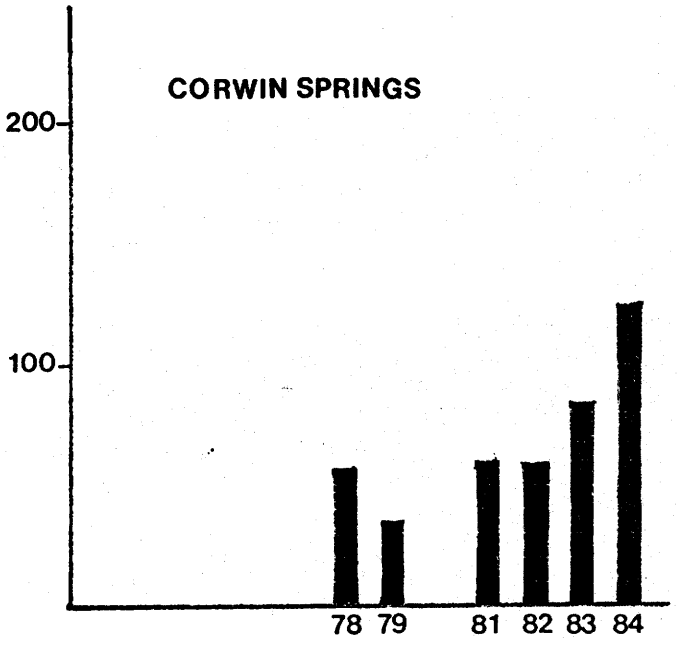


Figure 5. Spring population estimates of Yellowstone cutthroat trout longer than 12 inches per mile during the years indicated in the four study sections.

indicates that there is a proportionately small number of older fish in the population. Restrictive regulations took effect during 1984 in an attempt to increase the number of larger Yellowstone cutthroat trout. Clancy (1984) and Javorsky (1984) discuss the effect of fishermen on the trout populations in more detail.

Clancy (1984) found that excessive mortality rates among the cutthroat population may be limiting the number of larger fish. Population estimates from 1984 indicate that mortality was lower during 1983 than 1982. This may be related to lower fishing pressure during the summer months as a result of turbid water conditions (Clancy, 1984).

The Springdale and Corwin Springs sections of the river support the highest populations of cutthroat trout. These two sections are supported by more spawning tributaries than the other two sections (Figure 6). Clancy (1984) found that recruitment of two year olds is highest in the areas which have the best spawning tributaries nearby. Dewatering of tributaries in Paradise Valley and the Livingston area has probably affected recruitment of Yellowstone cutthroat trout into the Yellowstone River (Berg, 1975).

Movement. Yellowstone cutthroat trout movement in the mainstem of the Yellowstone River appears to be largely related to spawning migrations. Resident cutthroat in the river tend to spawn in tributaries upstream of and near their home territories (Clancy, 1984). However, some extensive movement is displayed by portions of the population.

If the river were divided into four arbitrary zones (Figure 6), the cutthroat trout in each zone appear to have some common movement patterns (Table 12).

Table 12. Arbitrary zones of the Yellowstone River for delineating Yellowstone cutthroat movement patterns.

Zone	Section	Spawning Tributaries
A	Corwin Springs to Point of Rocks	Mol Heron, Cedar, Tom Miner
B	Point of Rocks to Strawberry Cr.	Tom Miner, Big*
C	Strawberry Cr. to Shields River	Nelson Spring
D	Shields River to Springdale	Locke, Peterson, Nelson Spring

* Big Creek is included because one tag return was collected there, but the creek supports a very small run of fish.

There is considerable mixing within each zone (i.e., a cutthroat in zone A could spawn in either Tom Miner, Mol Heron or Cedar Creek). Also, some mixing does occur between zones (i.e., a cutthroat in zone D may move upstream and spawn in Nelson Spring Creek but is much more likely to spawn in Locke or Peterson Creek).

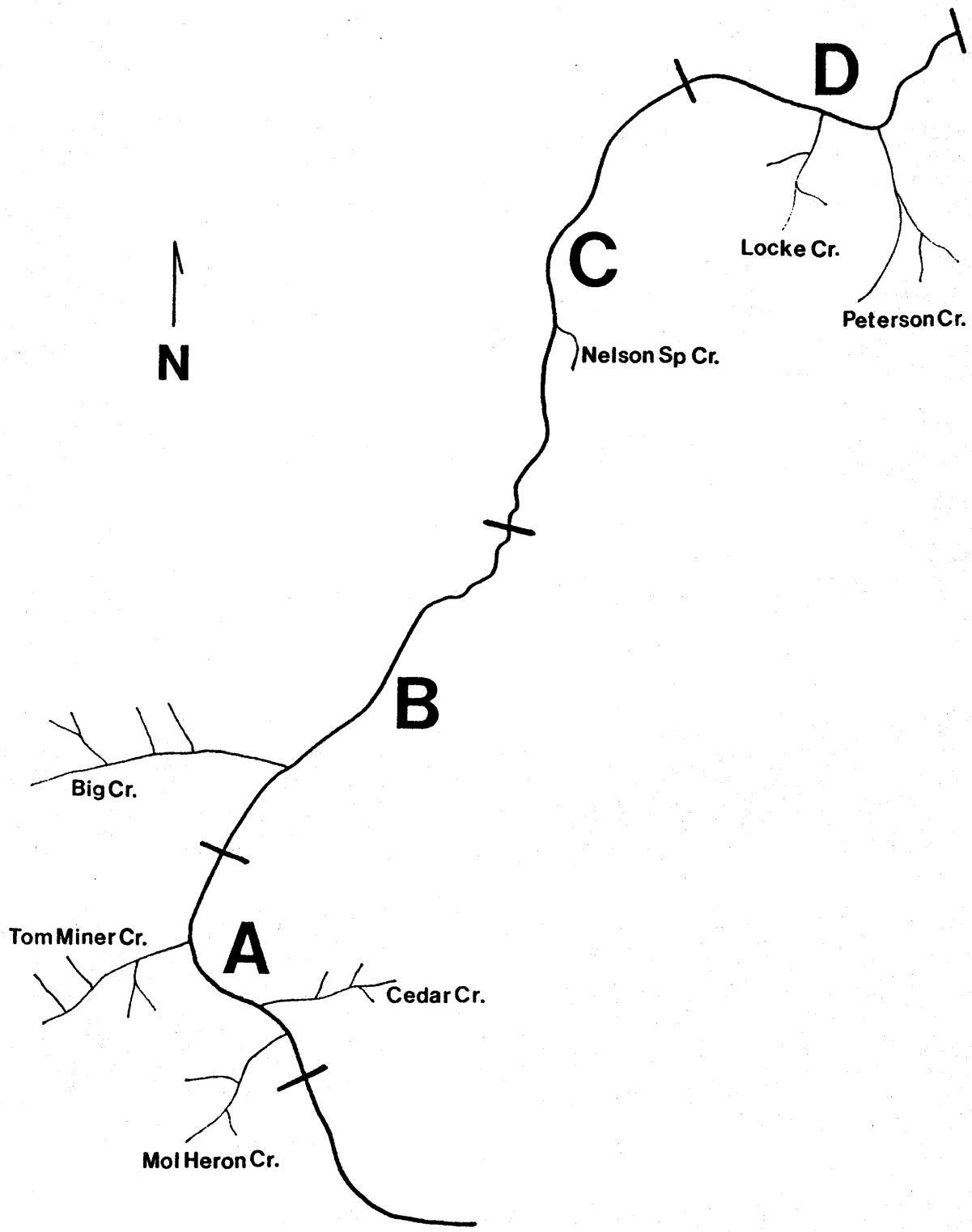


Figure 6. Yellowstone cutthroat spawning tributaries and arbitrary zones of the Yellowstone River from which the cutthroats migrate to spawn.

The above discussion is meant to give a general idea of the movement patterns of Yellowstone cutthroat in the mainstem of the Yellowstone River. Further study could identify movement patterns that differ from the above. No information is available on spawning by cutthroat in the mainstem Yellowstone River.

From the data collected to date, it appears that zones B and C have the least amount of spawning area supporting the population. The most extensive movements of individual fish takes place in the sections of river which have little spawning tributary habitat. Further discussion of this occurrence is found in Clancy (1984).

Spawning Survey. During the spring of 1984, Yellowstone cutthroat were tagged in the mainstem of the Yellowstone River. During June and July, tributary streams were sampled to assess the characteristics of the spawning runs in each (Figure 7). Refer to Clancy (1984) for information on spawning surveys during 1983.

Cedar Creek. Table 13 illustrates the dates Cedar Creek was sampled and contains pertinent information about the run.

Table 13. Vital statistics of the spawning concentration of Yellowstone cutthroat in Cedar Creek during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)	
6/22-7/20	37	(13.4)	31	(13.9)

Tom Miner Creek. Table 14 contains pertinent information characterizing the Yellowstone cutthroat spawning migration in Tom Miner Creek during 1984.

Table 14. Vital statistics of the spawning concentration of Yellowstone cutthroat trout in Tom Miner Creek during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Spawning Condition
7/2	7	(13.7)	5	(13.9)	Females not emitting eggs
7/6	19	(14.1)	17	(13.8)	Females emitting eggs
7/9	26	(13.8)	27	(14.0)	Females emitting eggs
7/12	20	(14.2)	17	(14.4)	Females emitting eggs
7/16	17	(14.2)	15	(14.4)	Females emitting eggs
7/23	7	(15.0)	7	(14.0)	Females emitting eggs
Total	96	(14.1)	88	(14.1)	

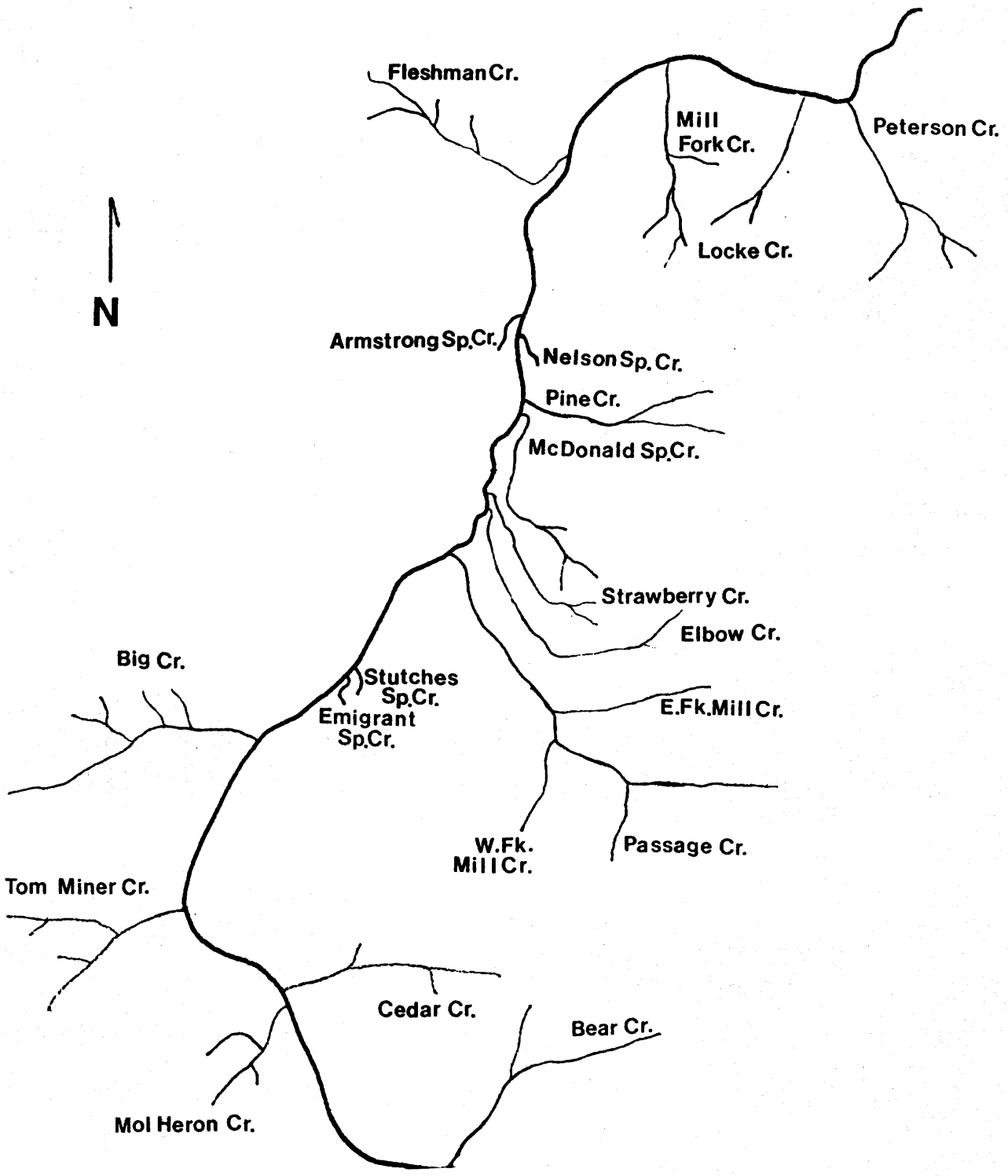


Figure 7. Tributaries of the upper Yellowstone that were sampled for migratory or resident populations.

The section of stream that was sampled during 1983 and 1984 is located above 1/2 mile upstream from the mouth. The section is approximately 400 feet long, the midpoint of which is at the county bridge.

The peak of the spawning run appeared to be in mid-July during 1984.

During 1984 more fish were captured per sample than during 1983. Effort was constant, therefore, it appears that more fish were spawning in the creek during 1984. This may be related to the fact that 4 year old cutthroat trout were available in large numbers in the Yellowstone River in 1984.

Six fish that had been tagged previously were captured in the creek. Three were tagged downstream and one was tagged upstream of Tom Miner Creek in the Yellowstone River. The three fish that were tagged downstream of Tom Miner Creek migrated between 16 and 25 miles. Clancy (1984) discussed upstream movement of cutthroat trout into Tom Miner Creek.

Of the fish that were captured more than once during 1984, the average length of time between captures was 7.8 days for males (range 3-14 days) and 6.4 days for females (range 3-21 days).

Cedar Creek. Sampling during 1984 was conducted by the Montana Cooperative Fisheries Unit. Between June 22 and July 20, 71 cutthroat trout were sampled by trapping and electrofishing. The average length of fish sampled was 13.4 inches and the distance that fish moved to eenter the creek was similar to 1983 (Clancy, 1984).

Nelson Spring Creek. Table 15 lists the characteristics of the Yellowstone cutthroat trout spawning migration into Nelson Spring Creek during 1984.

Table 15. Vital statistics of cutthroat trout sampled in the lower 300 feet of Nelson Spring Creek during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Spawning Condition
6/25	2	(16.9)	3	(13.9)	Females emitting eggs
7/2	3	(13.1)	0		
7/9	5	(14.9)	6	(15.4)	Females emitting eggs
7/16	5	(14.1)	7	(15.2)	Females mostly spent
7/23	3	(15.2)	2	(13.5)	Females spent
Total	18	(14.7)	18	(14.9)	

The peak of the run during 1984 was probably between 7/9 and 7/16.

Four tag returns were captured in the creek during 1984. Two had been tagged in the Springdale study section and two had been tagged in the 9th Street study section. At this time, this is the only known spawning area for Yellowstone cutthroat in the Livingston area.

Locke Creek. Table 16 characterizes the Yellowstone cutthroat trout spawning migration in Locke Creek during 1984.

Table 16. Vital statistics of cutthroat trout captured in a trap at the mouth of Locke Creek during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Temperature Max-Min
6/21	3	(14.1)	4	(14.8)	57-49
6/22	2	(11.8)	0		60-44
6/26	1	(14.4)	4	(14.7)	63-48
6/28	1	(16.7)	2	(15.1)	61-49
6/29	2	(16.0)	3	(14.6)	63-51
7/3	0		1	(14.3)	62-49
7/5	2	(16.3)	0		62-51
7/13	2	(16.3)	0		60-52
Total	13	(14.9)	14	(14.7)	

The trap was installed on 6/20, at which time fish were already in the creek. The peak of the run may have been during late June.

Tag returns indicate that fish spawning in Locke Creek were tagged between Sheep Mountain and Springdale. This is the same general area that fish spawning in Peterson Creek come from (Clancy, 1984). There is some mixing of fish between Locke and Peterson Creek. A male cutthroat trout was captured in Locke Creek on 6/21/84 and subsequently caught in Peterson Creek on 6/27/84.

Peterson Creek. Table 17 lists the characteristics of Yellowstone cutthroat trout captured in Peterson Creek during 1984.

Table 17. Vital statistics of cutthroat trout captured in Peterson Creek during 1984.

Date	Males ($\bar{x}$ length)		Females ($\bar{x}$ length)		Temperature Max-Min
6/22	4	(14.9)	5	(14.6)	57-48
6/25	2	(14.2)	2	(15.3)	62-43
6/27	2	(13.6)	1	(16.6)	62-48
6/28	1	(15.4)	0		60-48
6/29	0		1	(13.1)	63-50
7/6	1	(16.1)	3	(14.8)	63-50
Total	10	(14.7)	12	(14.8)	

The fish were captured by trapping and electrofishing. The run probably peaked in late June as it did in 1983 (Clancy, 1984).

Nine tag returns were captured in the creek, all of which were tagged downstream of the creek.

Bear Creek. Oswald (1982) identified a spawning movement into Bear Creek (Figure 7). Sixteen migratory cutthroat were captured between July 9 and July 22, 1981. He felt that the run was substantial and probably was significant to the Yellowstone River fishery.

McDonald Creek. A trap was installed at the mouth of the creek during June and July, 1984. It was ineffective in capturing migratory cutthroat trout. Berg (1975) and Clancy (1984) found a spawning run of Yellowstone cutthroat into this stream.

Emigrant Spring Creek. A trap was installed in this stream during June and July, 1984. No migratory cutthroat trout were captured and it is doubtful that the creek supports a significant run.

Strawberry Creek. The lower 800 feet of the creek was electrofished during July, 1984. A few sculpins and mountain whitefish were captured, however, no Yellowstone cutthroat trout were captured.

Elbow Creek. The lower 700 feet of the creek was electrofished during July, 1984. The creek supports a more substantial population of fish than Strawberry Creek and a few cutthroat trout were captured, but it is not known whether they were migratory or resident fish.

Mountain Whitefish

Spawning Concentrations. Some data was collected on mountain whitefish movement into tributary streams of the upper Yellowstone . Most data on

mountain whitefish was incidental to information collected during brown trout surveys.

Stutches Spring Creek. A trap was installed at the mouth of Stutches Spring Creek during October and November of 1984 to capture migratory fish. While a few brown trout were captured, many mountain whitefish were captured. Table 18 characterizes the movement of mountain whitefish into Stutches Spring Creek. Fish were sexed only when sexual products could be seen. Also, the trap was opened on weekends to allow fish to move freely around it. Therefore, there is no way of knowing how many fish were captured more than once.

Large numbers of males moved into the creek during late October and again between November 8-14. Females were found moving up in large numbers during early November. Females averaged slightly longer than males (Table 18).

Table 18. Characteristics of the mountain whitefish captured in a trap in Stutches Spring Creek during 1984.

Date	Males	($\bar{x}$ length)	Females	($\bar{x}$ length)	Unknown	Temperature Max-Min
10/23	4	(9.8)	0		0	47-42
10/24	6	(12.2)	2	(11.5)	0	47-41
10/25	9	(12.2)	3	(12.3)	1	48-42
10/26	13	(11.9)	2	(12.4)	0	48-40
10/30	26	(11.8)	3	(12.3)	1	46-38
10/31	14	(11.8)	1	(12.8)	0	44-40
11/1	12	(12.0)	6	(12.2)	5	
11/2	6	(12.5)	0		1	
11/7	1	(13.3)	4	(11.7)	0	46-40
11/8	35	(12.0)	9	(12.3)	1	47-42
11/9	36	(12.1)	22	(12.1)	1	44-42
11/13	8	(11.7)	3	(13.0)	1	46-40
11/14	22	(11.7)	4	(12.2)	2	44-40
11/15	3	(12.3)	0		0	42/38
Total	195	(11.9)	59	(12.2)	13	

Yellowstone River Water Temperature

The maximum 5 day mean maximum water temperature at Greybear during 1984 was 68.4° during August. This was slightly lower than the 1983 maximum (Clancy, 1984).

Shields River

Two sections of the Shields River were sampled during 1984. They are the Convict Grade section near the mouth and the Zimmerman section which lies just north of Wilsall (Figure 8).

Convict Grade

Brown Trout. Table 19 lists the population estimates of brown trout per 1000 feet in this section during 1982-84.

Table 19. 2 year old and 3 year old and older brown trout per 1000 feet of stream in the Convict Grade section of the Shields River during the spring of the years indicated.

	II	III+	Total
1982	70	22	32 (±5)
1983	14	34	48 (±9)
1984	13	34	47 (±9)

The population was stable during 1983 and 1984. The population was lower during 1982, this may have been related to instream flows as 1981 was a low water year in the Shields River. Clancy (1984) found that low summer flows may be affecting the brown trout population in the upper Shields River. There may be a similar relationship in the lower Shields River. Maximum water temperature was 76°F during July of 1984 (Figure 9).

Rainbow and Yellowstone Cutthroat Trout. Population estimates have been collected for these two species during the same time that brown trout estimates were collected. More sampling is needed before the populations can be characterized.

Mountain Whitefish. Table 20 lists the population estimates of mountain whitefish in the Convict Grade section during 1979-1984.

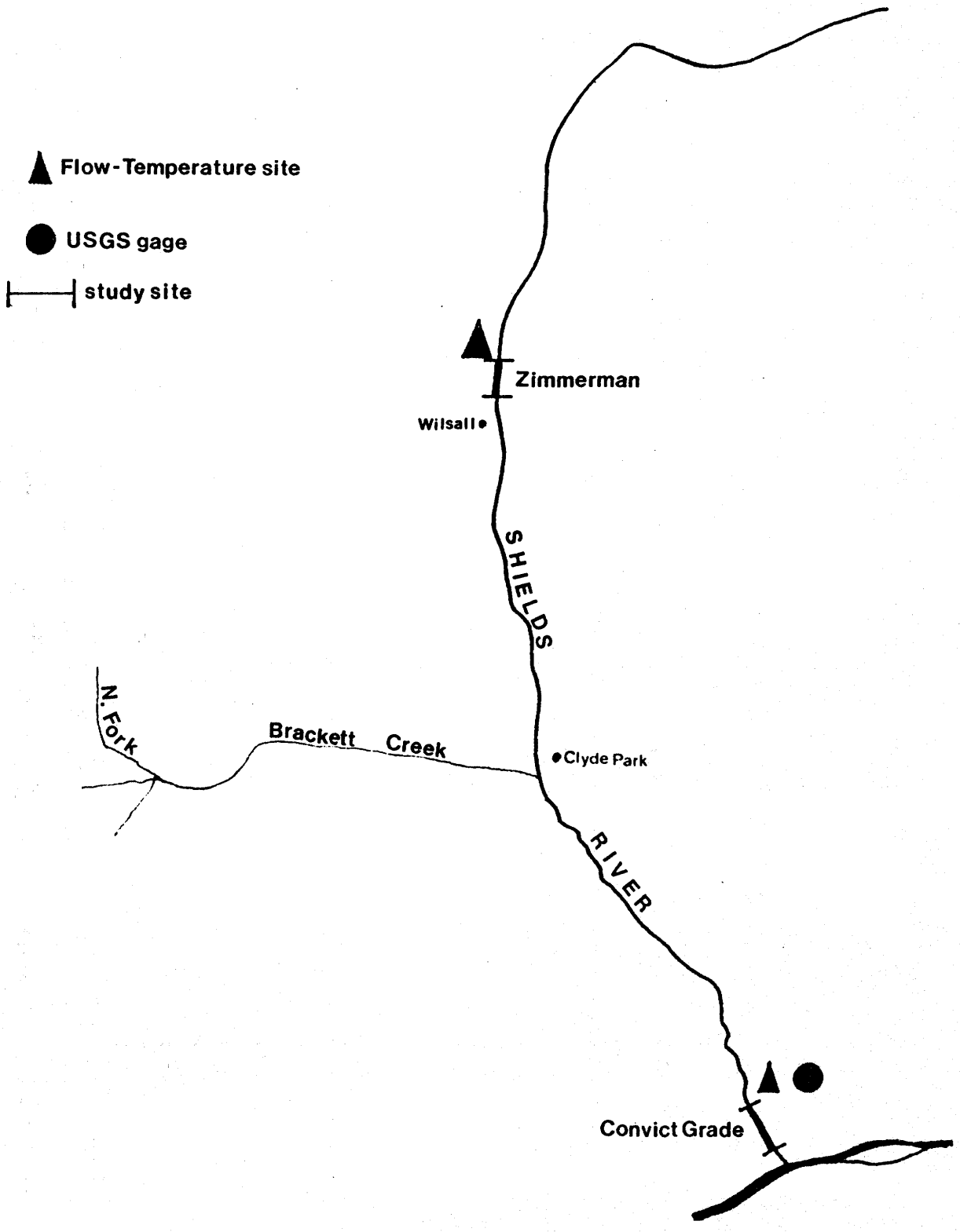


Figure 8. Map of Shields River drainage and Brackett Creek.

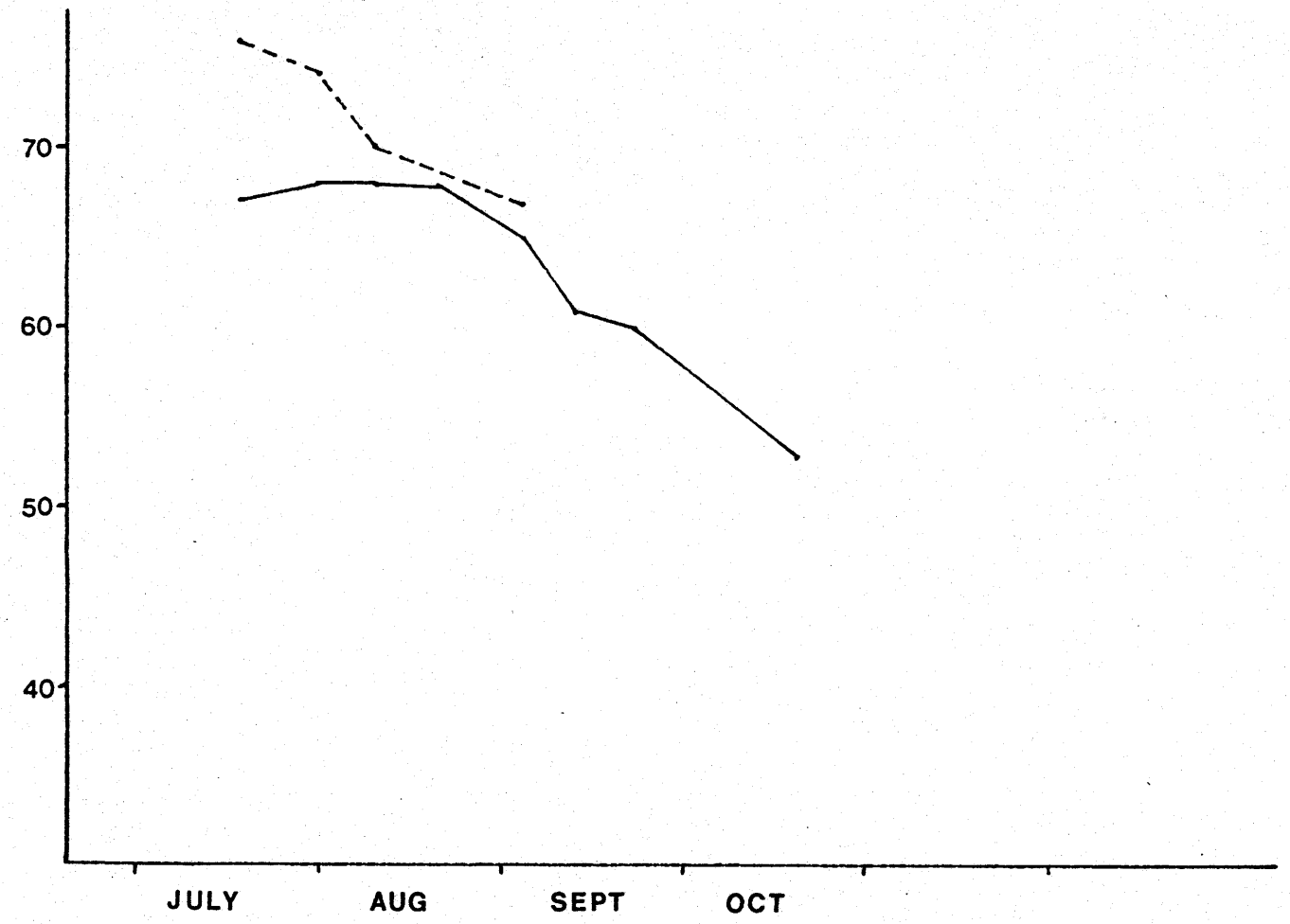


Figure 9. Maximum water temperature at Convict Grade (---) and Zimmerman (——) sections of the Shields River during 1984.

Table 20. Population estimates of mountain whitefish per 1000 feet in the Convict Grade section of the Shields River during 1979-1984.

	Size (inches)				
Year	6.0-9.9	10.0-13.9	14.0-17.9	18.0+	Total
1979	391	274	14	--	679 (±185)
1982	--	233	8	--	613 (±151)
1983	291	277	11	--	579 (±94)
1984	--	242	6	1	364 (±49)*

* 1984 total is for fish longer than 6.5 inches.

Mountain whitefish are much more abundant than trout in this section, however, the population declined significantly between 1983 and 1984.

Zimmerman

Brown Trout. Table 21 lists the population estimates by age of brown trout in the Zimmerman section between 1980 and 1984.

Table 21. Population estimates per 1000 feet of brown trout in the Zimmerman section of the Shields River.

	Age				Mortality	
Date	I	II	III	IV+	F-S[1]	S-F[1]
1984-Fall	29					
Spring		17	20	51	0	
1984-Fall	32	30	27	24		55
Spring		19	45	54	4	
1982-Fall	55	43	19	37		26
Spring		43	28	50	9	
1981-Fall	47	21	25	30		55
Spring		15	23	66	11	
1980-Fall	12	16	74			

[1] F-S indicates mortality between fall and the following spring; S-F indicates mortality between spring and the following fall. These figures are for III+ fish.

Clancy (1984) found that summer mortality exceeds winter mortality and attributed it to midsummer flows or possible movement. Maximum water temperature during 1981 was 68°F (Figure 9). Figure 10 depicts flows during 1984 in this section. The lowest recorded flow was 19.7 cfs on August 21. The mortality of younger age groups is unclear and inconsistent. Berg (1975) found little reproduction in the Shields River and postulated that reproduction in tributaries contributed significant numbers of young fish. Wipperman and Elser (1968) found the yearling and two year old brown trout composed only 11.6 and 5.1% of the population. Recent estimates indicate that yearlings and two year olds constitute a higher percentage of the population (Table 21).

Mountain Whitefish. Table 22 lists population estimates of mountain whitefish in the Zimmerman section during recent years.

Table 22. Population estimates of mountain whitefish per 1000 feet in the Zimmerman section of the Shields River during spring of the years indicated.

	Size (inches)			
	10.0-13.9	14.0-17.9	18.0+	Total
1979	270	21	1	272
1981	512	22	--	534
1982	312	17	--	329
1983	215	15	--	230
1984	180	10	--	190

The population has been decreasing since 1981.

Small Stream Resident Populations. Fish populations in the following streams were sampled to assess the characteristics of the fisheries. The smaller streams in the upper Yellowstone basin are the "lifeblood" of the Yellowstone River and many support a significant resident population of fish. The study of the upper Yellowstone River is incomplete without information on the small tributaries. Protection of the instream flows and physical habitat is important from two aspects. These streams provide a large portion of the water to the Yellowstone River and also should be protected in their own right as fishing pressure increases and other pressures increase on this valuable resource. The following discussion pertains to the resident populations in these streams.

Pine Creek. This stream flows into the Yellowstone River about 12 miles south of Livingston (Figure 7). It is used by recreationists primarily on the Gallatin National Forest beginning at the Pine Creek Campground. Pine Creek

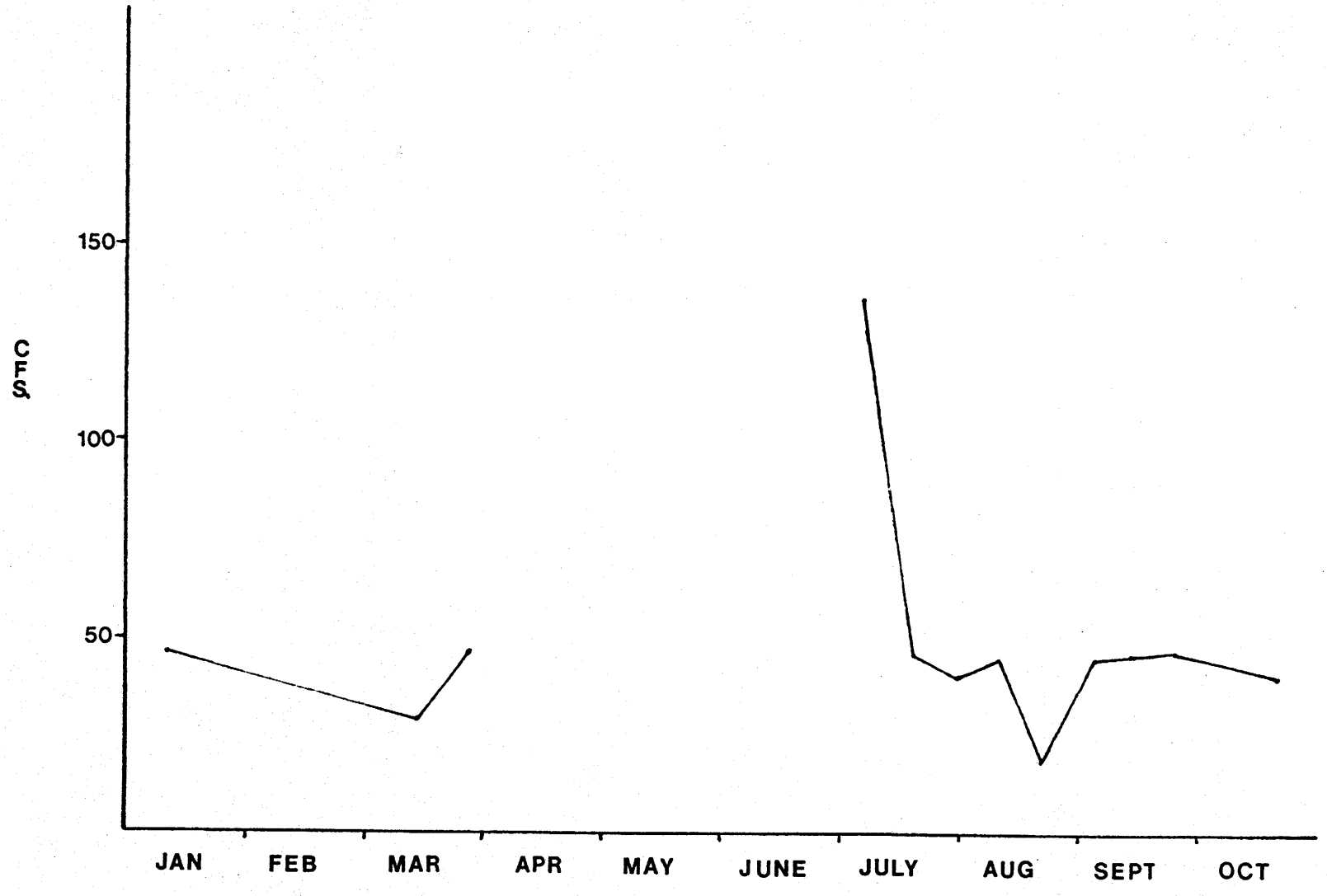


Figure 10. Flows in the Zimmerman section during 1984.

is dewatered in the lower reaches by irrigation withdrawals during the late summer months.

The creek supports a population of wild eastern brook trout (Salvelinus fontinalis) and a few rainbow trout which are stocked annually in the Pine Creek Campground. A population estimate was collected at Luccock Park, which lies west and just downstream of the campground. This work was done in anticipation of a diversion of water from the creek for hydropower generation. The population estimate of eastern brook trout during May, 1983 was 305 (±80) fish 5.0 inches and longer per 1000 feet of stream. The brook trout were between 2.9 and 9.9 inches. A few hatchery rainbow trout that had drifted downstream from the campground were collected.

Mill Fork Creek. This stream is a tributary of Mission Creek (Figure 7), and it supports a resident population of visually pure Yellowstone cutthroat trout. Mill Fork Creek has never been stocked, however, Mission Creek has been stocked with several species of fish.

This section of creek was electrofished during the summers of 1982 and 1984 in anticipation of logging in the Tie Creek drainage which enters Mill Fork Creek just upstream of the study section. The population estimates are listed in Table 23.

Table 23. Population estimates of Yellowstone cutthroat trout per 1000 feet in Mill Fork Creek during the summers of 1982 and 1984.

	$\hat{N}$ 3.0-4.9 inches	$\hat{N}$ >5.0 inches	$\hat{N}$ Total
1982	135	63	198
1984	51	62	113 (±27)

The difference between the two years is found in the number of small fish (3.0-4.9 inches). The estimates of fish longer than 5.0 inches were similar.

Big Creek. This stream enters the Yellowstone River approximately 7 miles south of Emigrant (Figure 7). The resident population consists of rainbow x cutthroat hybrids and a few brown trout. The section that was sampled is west of the Forest Service guard station about 5.5 miles upstream of the mouth (Table 24).

Table 24. Population estimates of rainbow x cutthroat hybrids per 1000 feet in Big Creek during 1980 and 1984.

	$\hat{N}$ 6.0-7.9 inches	$\hat{N}$ >8.0 inches	$\hat{N}$ Total
1980	15	17	32 (±11)
1984	33	12	45 (±11)

During 1980 there was a higher population of 8.0 inch and longer fish, however, during 1984 there was a higher population of fish smaller than 8.0 inches.

Mol Heron Creek. This stream drains into the Yellowstone River approximately 2 miles north of Corwin Springs (Figure 7). Past stocking practices included introductions of rainbow trout and cutthroat trout. The population in the creek is composed of rainbow x cutthroat hybrids, some of which are visually pure Yellowstone cutthroat trout. The data presented assumes that all fish within the stream are rainbow x cutthroat hybrids. The section of stream samples lies immediately downstream of the confluence of Mol Heron and Cinnabar Creeks. Table 25 illustrates the population estimates per 1000 feet during 1973 and 1984.

Table 25. Population estimates of rainbow x cutthroat hybrids per 1000 feet of Mol Heron Creek during 1973 and 1984.

	$\hat{N}$ 5.0-7.9 inches	$\hat{N}$ >8.0 inches	$\hat{N}$ Total
7/73	55	13	68
9/84	64	43	109

The population of fish longer than 8 inches has tripled since 1973. The reason for the difference is not known. The last recorded stocking of the creek was in 1962.

McDonald Creek. This stream drains into the Yellowstone River about 13 miles south of Livingston (Figure 7). It supports a population of brown trout. The section that was sampled is located at the mouth of the creek. Table 26 illustrates the population estimates during 1974, 1975 and 1984.

Table 26. Population estimates of brown trout per 1000 feet of McDonald Creek during 1974, 1975 and 1984.

	$\hat{N}$ 6.0-11.9 inches	$\hat{N}$ >12.0 inches	$\hat{N}$ Total
11/74	173	103	413
7/75	171	21	288
9/84	103	10	113 (±27)

The population of brown trout has decreased since the mid 1970's.

All sizes of brown trout were found in smaller numbers during 1984 than during 1974 and 1975. The 1974 estimate may be an overestimate on the larger fish because the work was done during November when brown trout are spawning and may be moving. This would bias the estimate toward an overestimate. However, the number of small fish was consistent between 1974 and 1975.

The stream data base lists the habitat trend as deteriorating, as a result of stock trampling. The area is grazed heavily and the riparian area is heavily used by domestic cattle. The stream bottom is largely covered with sand and silt which probably limit invertebrate production and fish numbers. Keller and Burnham (1982) found that trout populations were higher in ungrazed than grazed sections of stream and Alexander and Hansen (1983) found that brown trout increased in numbers when sand bedload was reduced in a stream. It appears that overgrazing and sedimentation are causing the trout population to be suppressed below its potential in McDonald Creek.

North Fork Brackett Creek. This stream drains into Brackett Creek about 15 miles west of Clyde Park (Figure 8). The population of fish is composed of eastern brook trout, Yellowstone cutthroat trout and a few mountain whitefish. This creek has not been stocked but Brackett Creek has been stocked as late as 1968, so it is not known if the Yellowstone cutthroat trout in the north fork are pure strain. The section which was sampled is about 100 yards above the confluence with Brackett Creek. Table 27 lists the population estimates during 1974 and 1984.

Table 27. Population estimates of fish per 1000 feet in North Fork Brackett Creek during 1974 and 1984.

	Yellowstone Cutthroat $\hat{N}$ >5.0"	Brook Trout $\hat{N}$>4.0"	Mountain Whitefish $\hat{N}$>4.0"
10/74	131	118 (±10)	100 (±11)
9/84	71 (±15)	176 (±26)	

The population of Yellowstone cutthroat trout has decreased since 1974 while the population of brook trout has increased. Mountain whitefish were not present in significant enough numbers during 1984 to obtain a population estimate. They may move into the creek later in the fall for spawning purposes.

The total number of brook and cutthroat trout has remained constant, however brook trout are a larger proportion of the population in 1984. It is not known if brook trout are out competing cutthroat trout. Griffith (1972) found that while young cutthroat were more aggressive, young brook trout were larger and angling selects against cutthroat trout. It appears that brook trout displace cutthroat trout in slower gradient areas of streams.

Mill Creek Drainage. The Mill Creek drainage receives a large amount of recreational use throughout the year (Figure 7). Collection of fisheries data was initiated in three major tributaries of Mill Creek during 1984 to assess the status of the fisheries in this drainage.

During September of 1984 Passage Creek, West Fork Mill Creek, and East Fork Mill Creek were sampled. Population estimates were obtained in the West Fork and East Fork (Table 28).

Table 28. Population estimates of Yellowstone cutthroat trout per 1000 feet in the East Fork and West Fork Mill Creek during September 1984.

	$\hat{N}$	lbs.
West Fork	27±7	10±3 (6.5" and longer)
East Fork	17±2	4±1 (5.0" and longer)

The fish in the West Fork are larger and more abundant than the fish in the East Fork. This could be the result of several factors including fishing pressure. Fisherman log information, while scanty, indicates that fish in the West Fork have decreased in size since the mid 1960's. If this is accurate, it could be a result of fishing pressure or dewatering of Mill Creek downstream of West Fork.

The lower 100 feet of Passage Creek was electrofished during September, 1984 to survey the creek. Three Yellowstone cutthroats were captured in the section, two of which were within 150 feet of the mouth. There appears to be a small resident population. No data exists on possible use by migratory fish.

Fleshman Creek. This creek, which flows through Livingston (Figure 7), was the subject of major renovation during 1980 and 1981 (Clancey, 1983). At that time, the creek downstream of the Sacajawea lagoon was dewatered and section (Enterprise) was renovated. The St. Mary's section was established as

a control. Table 29 illustrates the population estimates of brown and rainbow trout in the two sections.

Table 29. Population estimates of brown and rainbow trout in the Enterprise and St. Mary's sections of Fleshman Creek during the summer of the years indicated.

	Brown Trout			
	Enterprise		St. Mary's	
Date	I	II+	I	II+
1982	48	--	78	2
1983	65	17	116	27
1984	108	19	240	28

	Rainbow Trout			
	Enterprise		St. Mary's	
Date	I	II+	I	II+
1982	72	2	114	8
1983	94	10	18	19
1984	27	10	12	5

Fleshman Creek offers a unique opportunity to study the repopulation of a stream after the original population was removed. The repopulation from upstream is probably minimal in the Enterprise section because the Sacajawea lies immediately upstream. The St. Mary's section has trout populations upstream and downstream. Phinney (1975) and Workman (1981) found that streams which lost trout populations and repopulated naturally did so by the younger age groups. The same process appears to be occurring in Fleshman Creek.

Brackett Creek. The fishery in Brackett Creek has a reputation as producing a high quality fishing experience. The population is diverse, composed of brook, brown, Yellowstone cutthroat trout and mountain whitefish.

During 1975 two sections were sampled to assess the effects of fishing pressure on a heavily used section of Brackett Creek (Workman, 1976). The two sections did not appear to differ significantly.

Two sections were sampled again during 1984 to quantify gamefish populations and to assess any identifiable differences. The two sections that were sampled during 1984 are near the sections sampled during 1975. Table 30 lists the population estimates of gamefish during the indicated sampling times.

The Danswim section is near a public campground and the Harris section is on private land approximately one mile downstream. Rainbow trout were stocked in the Harris section according to the landowner. Stocking records indicate that rainbow trout were stocked in Brackett Creek for the last time in 1968.

Overall, the two sections have similar populations of fish. Since 1975 populations appear to have increased, however, the reasons for this increase and significance of the increase are unknown. Movement of brook trout and mountain whitefish may be occurring during sampling which would bias the estimates.

Table 30. Gamefish populations per 1000 feet of Brackett Creek during the years indicated in the Harris and Danswim sections.

	1975	1984
	Mountain whitefish >9.0"	
Harris	27	43
Danswim	49	167
	Yellowstone cutthroat >6.0"	
Harris	72	57
Danswim	46	73
	Eastern brook >5.5"	
Harris	--	43
Danswim	56	62

Miscellaneous Streams. Table 31 lists streams that were surveyed and the characteristics of the fish populations sampled.

Table 31. Various streams that were surveyed and the fisheries present.

Stream	Species	Size Range
George Creek	None	
North Fork McDonald Creek	Brook trout	4.3-7.9"
Poppe Creek	None	
South Fork Deep Creek	None	
Stoughten Creek	None	
Willow Creek	Brown trout	12.1-13.5"
	Yellowstone cutthroat	8.6-12.4"
	Long nose sucker	8.3"

Dailey Lake

Dailey Lake was capable of supporting a trophy trout fishery as late as the 1950's. In 1944 yellow perch were introduced into the lake (Johnson, 1965) and the fishery has been composed of a stunted population of perch since the mid 1970's.

Figure 11 illustrates the average size of yellow perch captured in gill nets since 1968. These figures were not collected by identical sampling techniques. The collections taken between 1968 and 1972 were taken during various times of the year, whereas the collection between 1977 and 1983 were taken during mid summer. The 1984 data was compiled by measuring random fish collected after the lake was rehabilitated.

The data indicates that the average length of yellow perch was decreasing in the early 1970's and that by 1977 the average size was 6.1 inches. The lake was rehabilitated in 1977 after sampling. In subsequent years, the average size of perch increased until 1980 when it levelled off and then fell to pre-rehabilitation levels in the early 1980's. The lake was rehabilitated again during 1984.

The rainbow trout have followed the same trends as yellow perch, with some differences (Figure 12). The average length was decreasing in the late sixties and early seventies also, until 1972 when the average length increased dramatically. Rainbow trout length was at an all time low during 1977 and increased after the lake was rehabilitated. The average length levelled off and dropped in 1981, but has increased every year since then.

In 1984 the fish that were sampled averaged 17.1 inches, which is longer than any previous year. The reason for this increase in average length may be related to the fact that few small trout are present. It appears that the latest rainbow trout stocks have not appeared in the population. It is unclear as to why these stocks have failed.

Walleye were introduced into the lake in 1979 in an effort to establish a predator which would control the perch population. In 1979 about 100 mature adults and 50,000 fingerlings were stocked. No evidence of reproduction by the adults was found, however, the fingerlings appeared to grow well, and by 1984 this cohort averaged 17.3 inches and 1.86 lbs. (Figure 13).

Subsequent stocking of walleye was composed of fry plants during 1980 and 1982. None of these fish have appeared in subsequent sampling and it is unclear if any survival occurred. During 1983 15,000 fingerlings were stocked in the lake. The fate of these fish is unknown, but there is some suspicion that high mortality occurred in the transportation process. Forney (1980) stated that efforts to reestablish walleye by stocking fry in lakes with stunted panfish populations had usually failed. Fingerling plants will be recommended for future management of the lake.

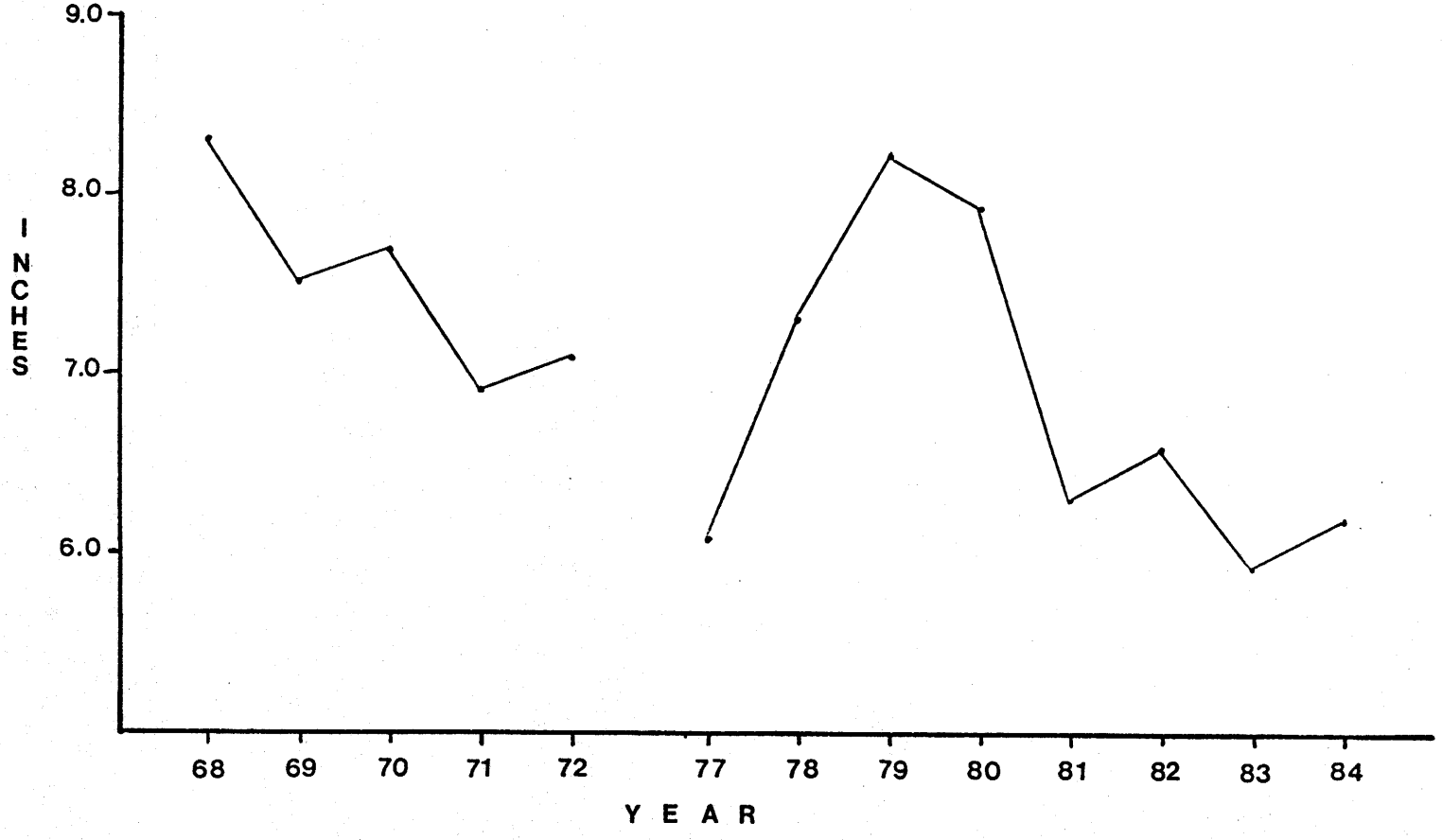


Figure 11. Mean length of yellow perch sampled in Dailey Lake during the years indicated.

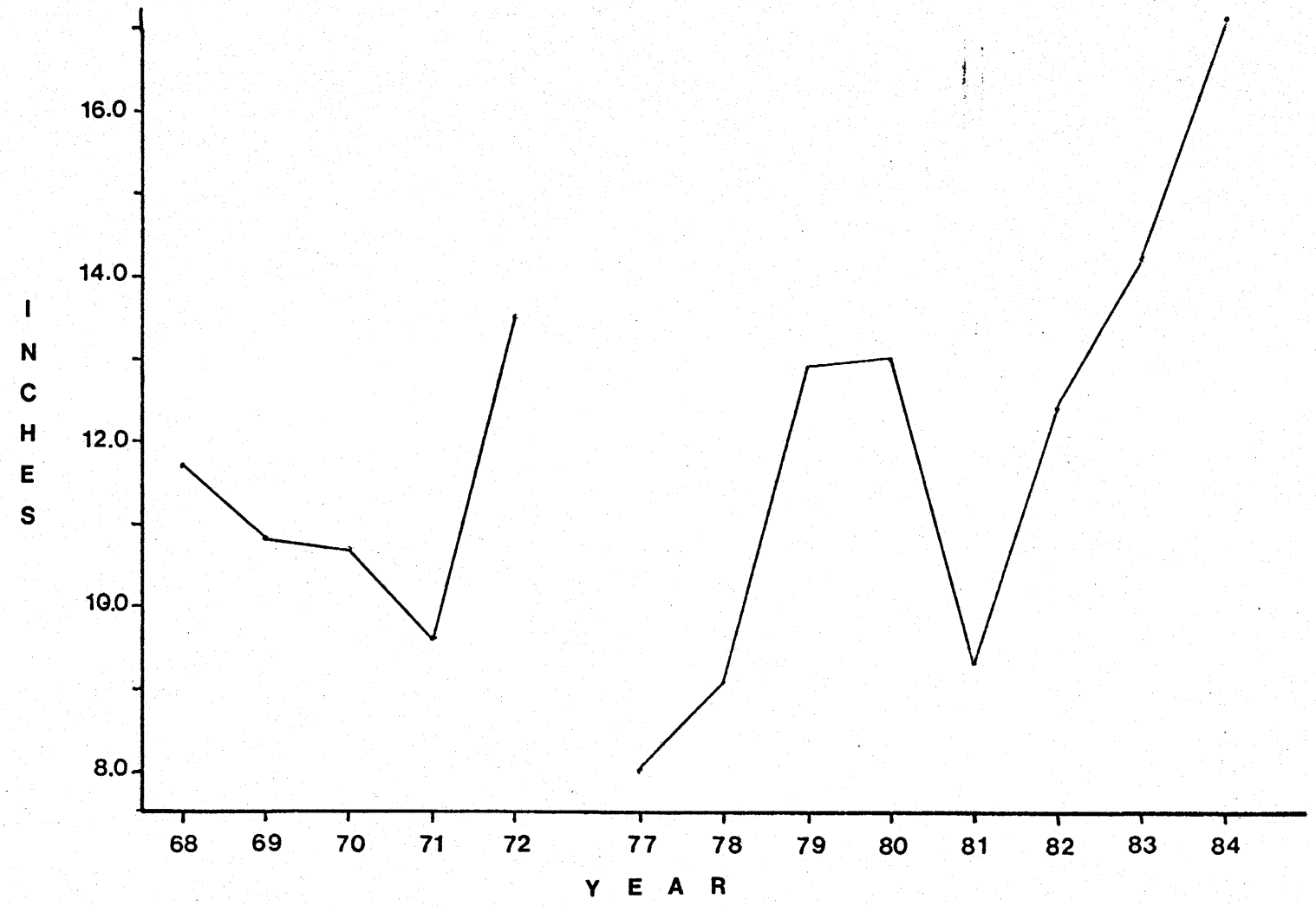


Figure 12. Mean length of rainbow trout sampled in Dailey Lake during the years indicated.

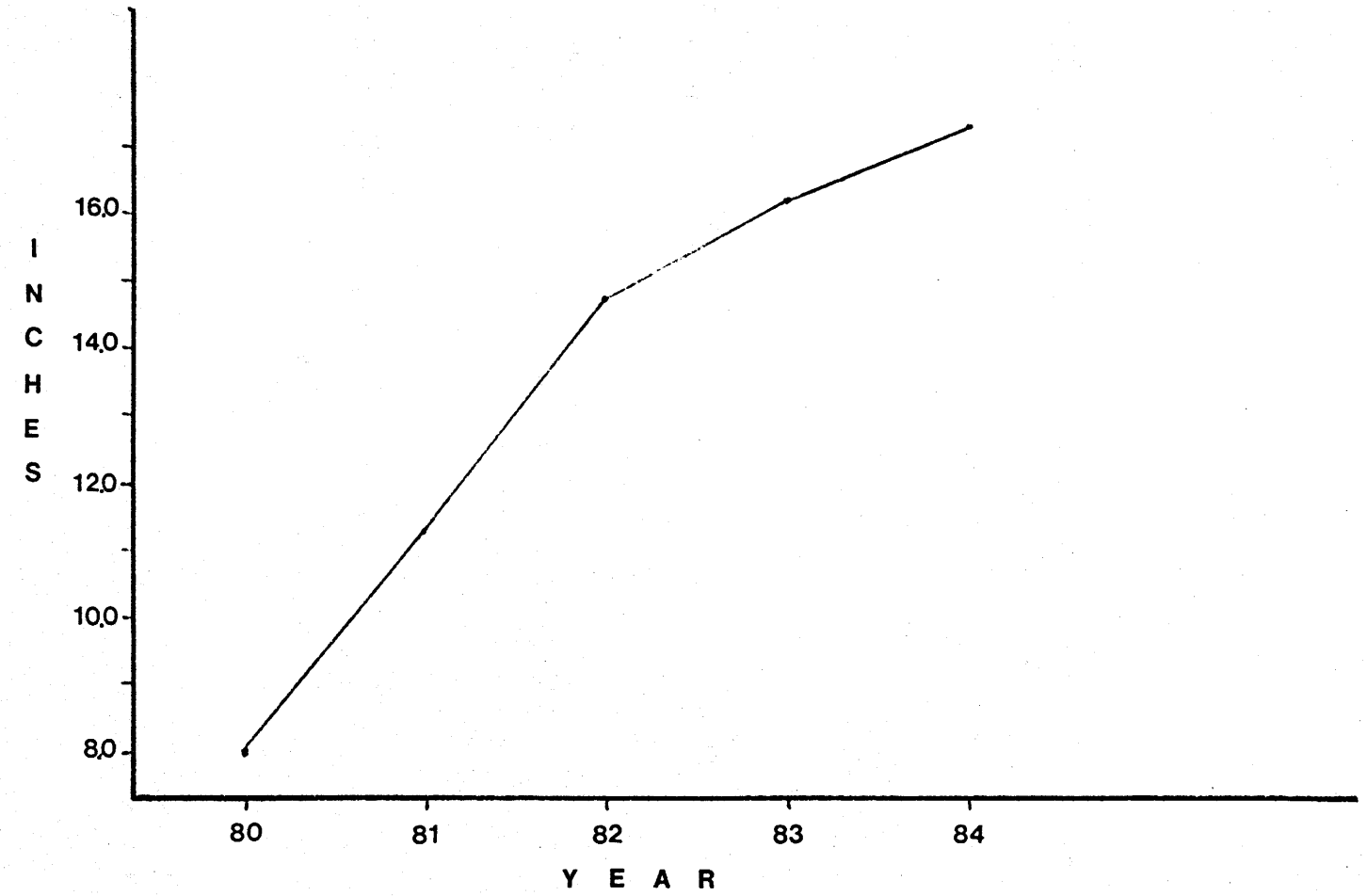


Figure 13. Mean length of 1979 plant of walleye in Dailey Lake during the years indicated.

Stream Protection

High quality stream habitat is composed of clean water, plenty of it, and a stable streambed and stream banks. The Stream Protection Act of 1963 and the Natural Streambed and Land Preservation Act of 1975 were enacted to insure a stable stream environment. While water quality and quantity are addressed by different regulations, these two laws are recognized as being responsible for maintaining the physical integrity of many streams in the state.

During 1984, the Department inspected 32 projects in Park and Sweetgrass Counties under the provisions of the Natural Streambed and Land Preservation Act and 7 projects under the provisions of the Stream Protection Act.

Shields River. The Shields River is characterized by frequent flooding and subsequent dewatering. This results in an unstable, silty streambed, eroding stream banks and an unstable trout population (Wipperman and Elser, 1968). Berg (1975) found that these conditions were detrimental to the younger age groups of trout. He found that salmonid reproduction in the mainstem of the Shields River was severely impaired.

Man's activities along the Shields River have had detrimental effects on the trout population. Johnson (1964) found that over 20% of a 51 mile section of the Shields River had been altered by man's activities. Workman (1976) found that between 1948 and 1973 the Shields River had lost 17.5% of its stream length between Clyde Park and the mouth. The Natural Streambed and Land Preservation Act was passed in 1975 and since that time the Shields River between Clyde Park and the mouth has regained some of its length (Table 32).

Table 32. Midstream length of the Shields River between the Clyde Park bridge and the mouth during the years indicated.

	Length (miles)	% + or -	Gradient (ft./mi.)
1948	19.82		20.2
1954	19.45	-1.9	20.6
1973	16.35	-15.9	24.5
1982	17.42	+6.5	23.0

The length of stream has increased and the gradient has decreased since 1973. This recovery is probably attributed to the enforcement of NSLPA.

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Date: 1985

Waters Referred To:

Dailey Lake	3-22-7644-03
Shields River	3-22-5362-01
Shields River	3-22-5334-01
Yellowstone River	3-22-7056-01
Yellowstone River	3-22-7070-01
Yellowstone River	3-22-7084-01
Armstrong Spring Creek	3-22-0140-01
Big Creek	3-22-0476-01
Brackett Creek	3-22-0784-01
Cedar Creek	3-22-1078-01
Deaf Jim Creek	
East Fork Mill Creek	3-22-2128-01
Elbow Creek	3-22-2282-01
Emigrant Spring Creek	3-22-2368-01
Fleshman Creek	3-22-2562-01
George Creek	
Locke Creek	3-22-3775-01
McDonald Creek	3-22-3930-01
Mol Heron Creek	3-22-4270-01
Nelson Spring Creek	3-22-4305-01
North Fork Brackett Creek	3-22-4361-01
North Fork McDonald Creek	
Passage Creek	3-22-4592-01
Peterson Creek	3-22-4020-01
Pine Creek	3-22-4662-01
Poppe Creek	
South Fork Deep Creek	3-22-5726-01
Stoughten Creek	
Strawberry Creek	3-22-6146-10
Stutches Spring Creek	
Tom Miner Creek	3-22-6328-01
West Fork Mill Creek	3-22-6636-01
Willow Creek	3-22-6902-01

Key Words:

Population survey
Spawning migration
Brown trout
Rainbow trout
Overgrazing
Yellowstone cutthroat
Mountain whitefish
Dewatering
Siltation
Repopulation

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